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Edited by JOHN BARTLETT.

PHOTOGRAPHY IN NATURAL COLORS.

AT the last monthly meeting of the Franklin Institute, Mr. F. E. Ives read a paper on the subject of heliochromy, which was an addition to the communication made last February. We were not present, but see it stated in the *Philadelphia Ledger* that illustrations were shown which seemed to fully confirm Mr. Ives' claims as to the efficiency of his process. Most of the first part of the paper was devoted to the theory of light and color sensation, and included numerous brief extracts from a recent text-book on color, which were quoted for the purpose of showing that the method, as now practised, is in strict accordance with the recognized scientific facts. He concluded as follows:

"After experimenting with several sets of reproduction pigments, adjusting color-screens so that I could make the process counterfeit the spectrum with any set of pigments, I finally adopted reproduction colors which call for negatives of the spectrum showing curves of intensity approximating to the curves in Maxwell's diagram illustrating the action of the spectrum upon the different sets of nerve fibrils. These reproduction colors are certain shades of red, green and blue light, or their complementary colors in pigments, which approximate to Prussian blue, magenta red and aniline yellow, the first two of so light a shade that it is necessary to superimpose one upon the other to obtain a full violet blue, the blue upon the yellow to obtain green, and the magenta upon yellow to obtain red.

"When I made my first communication upon the subject I assumed, with Helmholtz, that there might be some latitude in the selection of type (reproduction) colors, and therefore did not commit myself to the use of any particular ones, but merely showed how I would produce at will negatives of the spectrum having any curves of intensity that might be required in order to secure the proper distribution of such colors or pigments as were selected. The adoption of reproduction colors corresponding to what are now recognized to be primary color-sensations, has made it possible for me to state more definitely my mode of procedure, as above.

"What I claim as new and original in my method is (1) the production of heliochromic negatives by exposing color-sensitive plates through compound color-screens, which have been adjusted to secure negatives showing curves of intensity which bear a certain definite relation to the colors employed to produce the helio-

chromic pictures; and (2) the production of heliochromic negatives by a procedure calculated to yield negatives of the spectrum showing curves of intensity which probably correspond to the action of the spectrum upon the sets of nerve fibrils.

"Admitting the theoretical soundness of my mode of procedure, which I believe I have fairly demonstrated, there remains only the question of practicability and commercial value to be considered. The process is practicable, if the same operations, repeated in the same manner, can be relied upon to produce pictures which counterfeit the light and shade and color of all objects. Three subjects which I shall show to-night, a delicate oil-painting, a brilliant Prang chromo, and a beautiful sea-shell, were made with the same light, same camera, same preparation of sensitive plates, same set of color screens, same relative exposures and same development. They show a very great variety of colors, mostly compound in the painting and chromo, but pure spectrum colors in the sea-shell; yet the colors of all are alike faithfully counterfeited to the eye. Although there should be no question of the fact, I will here state that these finished results have been obtained without any retouching or artificial manipulation whatever."

THE LARGEST CAMERA IN THE WORLD.

Read before the Photographic Society of Philadelphia.

THE recent completion of the great Lick telescope, and the success which has attended its use for general astronomical purposes, have been subjects of interesting discussions, both among astronomers and mechanicians, and an examination of the photographic features of the instrument may not be without interest to photographers. Before entering into a description of the attachments of the telescope which are particularly devoted to photography, a brief general account of the instrument may be necessary in order to make clear the arrangement of the parts.

As the vital point in a camera is the lens, so the objective is the great point in a telescope, and the objective of the Lick telescope, the last and greatest work of the veteran Alvan Clark, is the first and most important part of the instrument. The clear diameter of the lens is 36 inches, and it is composed of two disks of crown and flint glass respectively, both disks being cast by Feil, of Paris, and ground and figured by Mr. Clark, at Cambridgeport, Mass.

The production of a satisfactory and homogeneous disk of glass, free from waves and striæ of unequal density, is a most difficult matter, and in the case of the disk of crown glass a satisfactory casting was secured only after nineteen failures. The crown glass lens is a symmetrical double convex figure, both faces being worked to curves of 259.52 inches radius, and the double concave flint disk has its front face worked to a radius of 239.59 inches, and its back face is curved to a radius of 40,000 inches. The disks are not cemented, but are mounted 6½ inches apart, the combination having a focal length of 678 inches, or 56 feet 6 inches.

This lens, the largest in the world, is mounted in a tube of cast-iron and steel, the tube being four feet in diameter in the middle and tapering to three feet at the ends. This is mounted equatorially, and some idea of the weight and solidity of the parts may be obtained from the fact that the polar axis is a steel spindle ten feet

long and twelve inches in diameter, and it alone weighs 2700 pounds. The weight carried by this axis is about 20,000 pounds, and in order to relieve the spindle as much as possible, a series of anti-friction rollers are placed just beyond the first bearing to take a portion of the weight.

The instrument is mounted on a hollow cast-iron column, built up in sections, the driving clock and regulator being placed in the column and connected by electric control with a standard astronomical clock, and with the chronograph.

The control of the telescope in all its movements is effected by the numerous handles which are gathered around the eyepiece and upon the top of the column. The instrument is intended to be controlled by the observer and an assistant on the column, although for rapid movements in right ascension and declination help may be given by an assistant on the floor. The various handles and attachments for the use of the observer are mounted on a large ring around the eyepiece, which carries the handles for clamping the instrument or giving slow motion in right ascension or in declination, and also carries the reading microscopes and finders and a small sidereal clock. Electrical switches are also provided by which the driving clock can be started or stopped, and the illumination of the divided circles controlled.

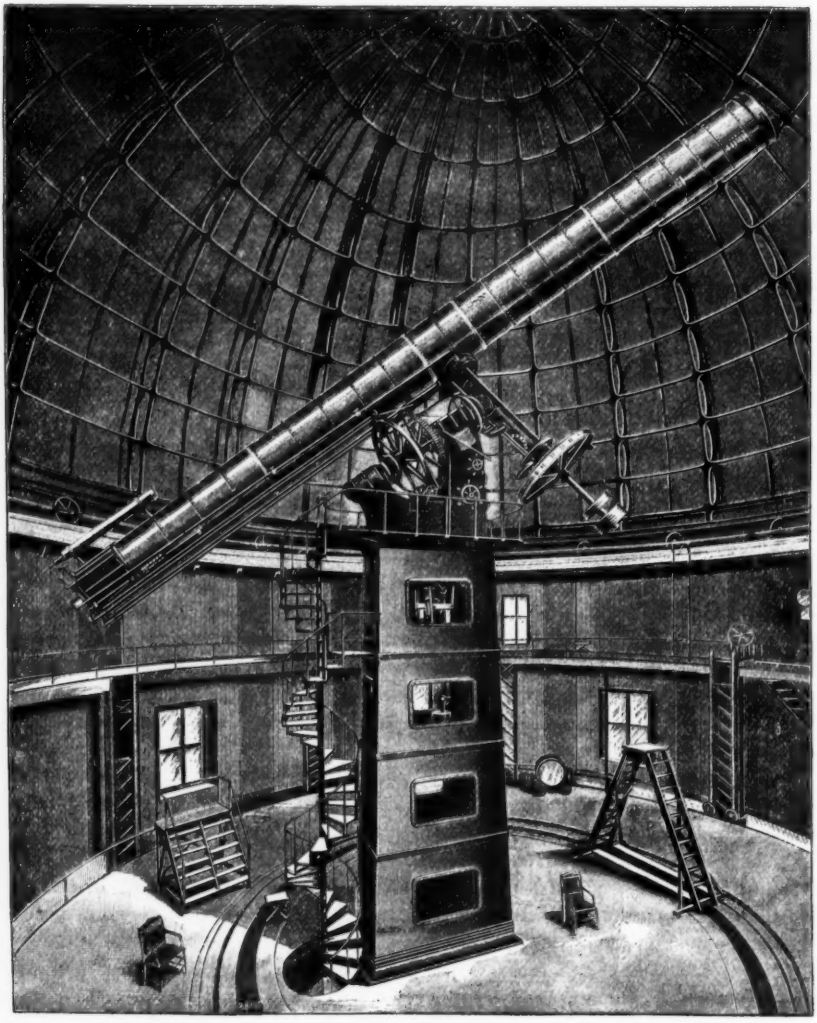
It has been customary in large telescopes to provide a chair for the observer, which followed the motion of the eye end of the instrument, but the inconveniences of this method increase with the size of the apparatus, and in the case of the Lick telescope it was decided to adopt the method proposed by Sir Howard Grubb, of making the entire floor of the dome rise and fall to bring it at all times within a convenient distance of the eyepiece. As this movable floor is sixty-one and a half feet in diameter, and has a rise and fall of sixteen feet, the magnitude of the task is apparent. The motion of the floor is caused by four telescopic hydraulic rams operated by a differential valve provided with an indicator which may be read in the dark. A hole in the middle of the floor provides space for the column of the telescope and for a staircase, and the entire motion of the floor is accomplished upward in less than nine minutes, and downward in five minutes.

The great dome is also controlled by hydraulic power through the medium of an endless wire rope, and in this manner the unusually heavy parts are kept as completely in hand as in the case of smaller and lighter apparatus.

The most interesting part of the outfit to photographers, lies in the accessory apparatus for use in celestial photography, and as the telescope when arranged for photography may be considered the largest camera in the world, some of its details in this direction are worthy of especial notice.

In the first place the objective was figured and corrected solely for visual purposes, and was therefore unsuited for photographic work, and in order to provide the necessary correction an auxiliary corrective lens was made to be mounted in front of the original lens.

This corrective lens is of crown glass 33 inches in diameter, and may be seen in the illustration on the floor, on its carriage which has been provided for handling it. When this lens is placed in front of the regular objective, it not only makes all the corrections necessary for photographic work, but also shortens the focal length of the entire combination ten feet, thus making the position of the plate holder come some distance within the eyepiece. This permits the entire apparatus about the eyepiece

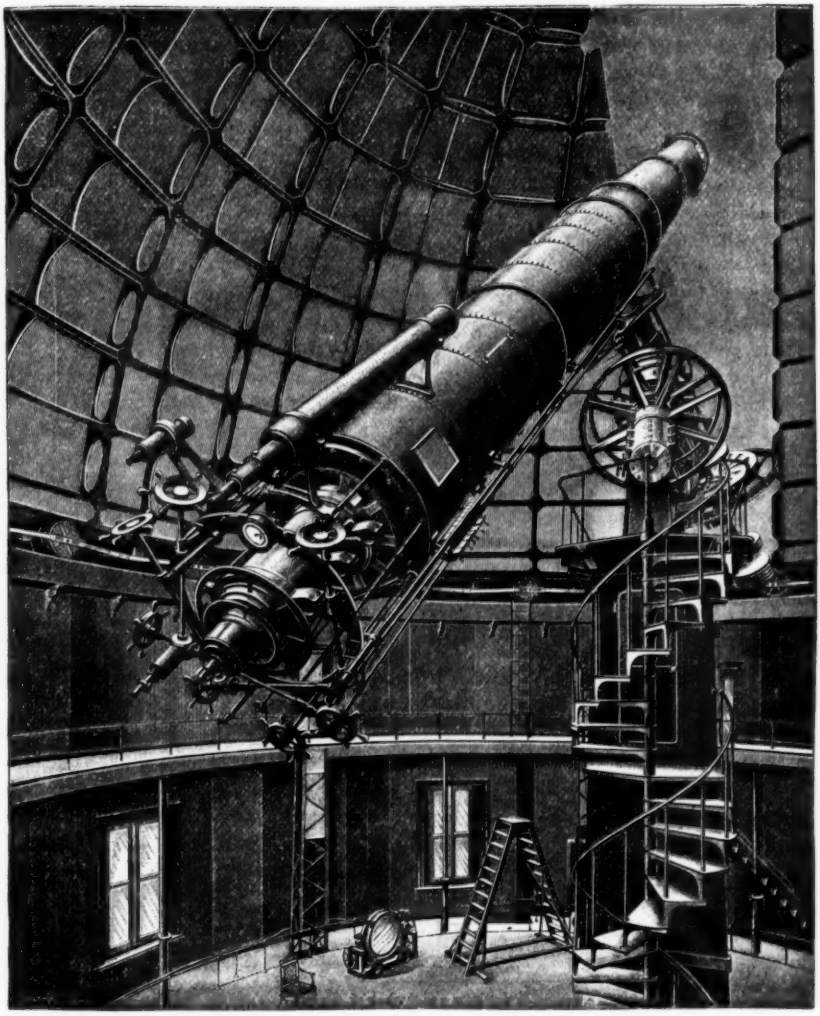


36-INCH EQUATORIAL TELESCOPE.

LICK OBSERVATORY,

MOUNT HAMILTON, CALIFORNIA.

OBJECTIVE BY ALVAN CLARK & SONS. MOUNTING BY WARNER & SWASEY.



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to remain undisturbed when the telescope is used for photography, the holder and its attachments being introduced into the tube through an opening in the side.

Within the tube at this point is a carriage composed of two rings of about the inside diameter of the tube, these rings being connected together by four rods. On these rods the sliding portion of the carriage is fitted, and by means of screws the frame may be moved and adjusted in any desired position. As the rays of light from celestial objects are practically parallel, the camera is of fixed focus, and when the proper point is once determined there is no use for any focusing screen, and the screw motion which acts on the carriage is provided with a pointer which indicates the exact focus. This pointer traverses past an index which is graduated for various degrees of temperature, for the expansion and contraction of the great tube would otherwise destroy the sharpness of the image.

The plate holder 23 inches square, carries a plate 20″ by 20″, and slides into grooves in the carriage, where it is held by a spring. The holder is provided with shutters which are operated from without the tube, so that exposures may be made in that manner.

When an enlarged image is desired, the holder is not slid into the carriage, but in its place is put an enlarging lens of two inches aperture and twelve inches focus. This magnifies the image formed by the large objective, and projects it toward the eyepiece, which is then removed, and a small camera substituted to receive the enlarged image. This enlarging lens is fitted with a time and instantaneous shutter, operated from without the tube, so that enlarged photographs of the image formed at the focus of the telescope may be made direct, without being reproduced as in ordinary methods of enlarging.

Although the telescope as a camera has been in use such a short time, some very satisfactory work has been done, and the great light-gathering power of the 36 inch objective will doubtless reveal detail in the photographic work that a smaller instrument would be unable to secure.

Great credit is due to Messrs. Warner & Swasey, of Cleveland, Ohio, for the skill which they have displayed in the designs for the mounting of the telescape, and for the care with which the work has been executed, and the success of the great camera is due quite as much to the designer of the mechanism as to the maker of the lens.

HENRY HARRISON SUPLEE.

SOLARISATION, FROM A THEORETICAL AND PRACTICAL STANDPOINT.

[*A Communication to the Edinburgh Photographic Society.*]

AS this is the first time on which I have addressed the Edinburgh Photographic Society upon this subject, I had better begin by stating that it is fully a year and a half since I commenced the experiments whose principal results I propose to touch upon to-night; and I may further add, that a portion of what I have to say now I published in the *British Journal of Photography* for January 13, 1888.

When a piece of sensitized albumenized paper is exposed for a few minutes to sunlight, is torn in halves, and one of the pieces is turned face down, and both are

again exposed for a period equal to the first, it will be found that while the piece exposed from the front and the back is lighter than the other by reflected light, by transmitted light it is considerably darker, although, through the light having had to penetrate the paper support, it may be considered that less has reached the film. This, among other things, tends to prove that light in reducing chloride of silver erects a barrier in its own path, as far as the rapidity of the formation of a visible image is concerned. A gelatino-bromide dry plate behaves in the same way with regard to the visible discoloration of the film, though to a much less perceptible extent. When fixed without development, of course the density is proportional, though not directly proportional to the duration of the exposure, the greatest alteration taking place in both cases at the outset. Still, the invariable rule obtains, that, under similar conditions, the longer the exposure the greater is the density. The addition of a solvent of silver salt facilitates the discoloration, at least up to a certain point, after which the difference of graduation is so light that it is difficult to observe with sufficient accuracy. The discoloration is also promoted by alkaline solvents more than by those which are neutral. Acids added to either form of film greatly retard or prevent a visible change, according to their power of dissolving the haloid salt or of oxidizing the metal produced.

(The foregoing notes are to be taken as general rules only, to which exception may be taken or be found. They are points of great theoretical interest, and though, personally, I am inclined to believe in an electrical action on the part of light, yet I would not put forward the foregoing save as a provisional classification of the great bulk of our observations of photographic phenomena.)

When a dry plate is first exposed and then "developed" so as to obtain pictures in the ordinary way, the preceding observations apparently hold good as far as the treatment of the film by solvents—alkaline, neutral, or acid—go. But over-exposure, solarization, or reversal, advance deeper problems for our solution. Before summarizing the results I obtained by a somewhat extended series of experiments, let me attempt to define the composition of a developer, seeing that such a definition as I could give formed the basis or working hypothesis upon which my experiments were undertaken.

A developer is essentially a solution (or vapor) from which metal is deposited upon a light-produced nucleus. It is customary, however, to restrict the term "developer" to that ingredient in it which throws down the metal. Nevertheless, I hold that the development of a daguerreotype is in principle the same as that of a calotype, wet plate, or stripping film, and differs from intensification with corrosive sublimate only in so far as the attracting nucleus is in the one case invisible, in the other visible, and the vehicle a vapor and an aqueous solution. Practically speaking, however, a developer consists of a solvent and a depositor, one or other being generally an accelerator,—or an electro-positive body similar in its action to the more refrangible rays of light, those of metallic or basylous origin. Thus in ammonia-pyro development we have,—

Ammonia, ...	Solvent of Ag. Br.
Pyro, ...	Depositor.
Ammonia, ...	Accelerator.

And in ferrous oxalate development,—

Potassium oxalate,	Solvent of Ag. Br.
Ferrous oxalate,	Depositor.
Ferrous oxalate,	Accelerator.

The fact that we can develop an image of the open mouth of an ammonia bottle —exposing and developing in the dark—sufficiently proves that the term "accelerator" is by no means superfluous; and to me the experiment affords one more proof that there is a closer affinity between the action of light and that of the electrical disturbance than is generally acknowledged.

By means of using apertures for objects in camera work, and for *clichés* in contact printing, I was enabled greatly to lesson my own trouble and simplify observation; while, by causing the exposures to overlap each other, I could easily get a hundred different periods represented on the same plate for twenty-five exposures actually made. I had six methods of working. Two in the camera—exposing on a circle of ground glass illuminated by diffused daylight, and on a gas flame. Two by contact in the printing frame—by direct sunlight, and by gaslight. And two with naked plates—exposed to sunlight and to gaslight. While, for the most part, I developed four, twelve, twenty-four, or one hundred exposures in the same developer, simultaneously and for exactly the same length of time, I found it impossible to work with anything like precision, the inconstancy of the developer and the absence of an automatic exposing apparatus being my chief difficulties. I had, therefore, to multiply my results, take averages, and, in the case of the more protracted exposures, resort to inspection by ordinate and co-ordinate.

From several thousand exposures I came to the following conclusions:—A. That when the film of bromide of silver is inconsiderable in thickness, the action of a strong light is instantaneous, complete, and irreversible. B. That with the seven brands of commercial plates upon which I further experimented, the facility of reversal, estimated by the duration of exposure required to produce a given result in conjunction with a constant developer employed for a fixed period, was greatest with the plates thinnest in silver, or with those with which it was difficult to get sufficient density. Edwards' most expensive plates and those of our own make required the longest exposure. C. Taking the ordinary negative image obtained in the camera, and the ordinary transparency obtained by contact with a negative, as the normal, the phases of reversal and re-reversal stand thus:— 1, normal; 2, neutral; 3, reversal; 4, second neutral; 5, second normal; 6, third neutral, etc. D. If the normal be produced with an exposure x, and the first neutral (invisible) with an exposure nx, then the first reversal will be obtained with an exposure n^2x, the second neutral with an exposure n^4x, and presumably so on; *e.g.*—

Normal,	5 seconds.
Neutral,	90 "
Reversal,	1,620 "
Second neutral,	29,160 "
Second normal,	524,880 "

E. Conjointly with light the reversing agent was found in the accelerator. An exposure calculated to give perfect neutrality, with a developer of a given strength used for so long, could be kept a fair normal by reducing the accelerator and adding re-

strainer, or it might be turned into a descent reversal either by prolonging the development or by increasing the proportion of accelerator. Restrainers restrained reversals in exactly the same way and extent as they restrained the normal image. The depositor, also, apparently played its customary part.

There is one point to which I would specially attract the notice of all theorists. While, practically speaking, we can easily see that the sum of the effect is due to the combination of "solarization" and "halation," as we term them, the real question which underlies the whole matter is this:—Why, with a constant plate, light, developer, and period of immersion, do different exposures give opposite conditions of transparency and opacity in the portions upon which the light was known to have impinged for the greatest length of time? The portions which exhibit halation, the portions which got least light,—these also exhibit the phenomenon of solarization. Hence, to attribute the latter to the former is equivalent to saying that the secondary effect is the cause of the primary impulse. I am attempting at the present time to reason out whether or not the interference and polarization of the light—which interference and polarization must of necessity exist to some extent—can have anything to say towards a solution of the mystery. The subject is a very difficult subject indeed, and positively bristles with subtle and undecided optical problems. With my own conviction that electrical currents are greatly concerned in the manifestations you are already familiar.

There are many other points connected with this subject which I should greatly like to touch upon, but I have already perhaps rambled too far. Let me then conclude by giving you the exact conditions under which I obtained negatives from negatives. I took what I consider a perfect, though possibly a rather thin, negative —a stronger one would have given better results, and would have been more easy to manage—and I laid it in an ordinary printing frame in the usual way. In the dark room I placed an "Ilford ordinary" plate against it, so that the films were in contact, and throwing aside the "backing" lest the pressure should break the negative, I shut the frame. Having found that twenty-seven minutes' exposure of a sharp aperture cut in a piece of wood gave me the best reversal, I decided that at least twice this exposure would be needed to allow the light to just penetrate the most opaque portions of my negative, under the conditions of illumination under which I had been previously experimenting, namely, at about six inches from the gas flame from a No. 3 "Bray" burner. An exposure of fifty-four minutes having proved too long, the reversal obtained being too clear and feeble, I tried forty-five minutes, and with such success that I have stuck to that exposure—for the same quality of negative, of course—ever since.

My developer for this was:—

Pyrogallol,	4 grain.
Ammonia,	1 minim.
Ammonium bromide,	0.05 grain.
Water,	1 ounce.

And my object in employing such a weak developer was to protract the time sufficiently to allow me full time to see what I was doing, as there is considerable difficulty in judging when the high lights are dense enough, on account of the general and unavoidable fog. I held a second developer, with twice as much ammonia and

bromide, in reserve, but upon this occasion I did not use it, though I have done so since, and got equally good results in less time. On arresting the development a more hopelessly fogged-looking production, pretending to intend to pass for a negative, I had never seen. As experience had taught me, however, first impressions are occasionally not to be relied upon, so I immersed my work of art in the hypo without many misgivings. On taking it out again, I was at first, by the light of the dark-room lantern, a little disappointed, but a stronger light minimized the appearance of fog, and "maximumized" the density of the high lights.

"The proof o' the puddin's the preein o't!" When prints from the original negative and the "reversal" were submitted to an expert, all he said was, that he couldn't see any difference between them; that, if anything, he liked number two best, because the modeling marks did not show so much; but that if I had not assured him to the contrary, he would have taken them to be prints from the same negative, the plate imperfections being the same in both. I did not tell him that while one of the prints took minutes the other took hours—not an equal number of each, however. Since that time I have made a good many negatives by the same process, but, having been taken for pastime, I gave them away readily as curiosities. Several shorter exposures were developed with developers of the normal strength, both pyro and iron, and at this distance of time I cannot tell whether they compared favorably with the slowly developed negatives or not; I know they were more uncertain.

The light, the distance, and the three-quarters of an hour, however, may be accepted, I venture to say, as standards of reference by any practical hand desirous of repeating this experiment.

HUGH BREBNER.

PRINTING-OUT PLATINOTYPE; AND A COMPARISON OF PLATINOTYPE PROCESSES.

(*Paper read by Mr. F. de Paula Cembrano, on October 11th, before the London Camera Club.*)

UNTIL quite recently we knew of but one method of printing with platinum. In this process, which is well known to most of us, a suitably-sized paper is sensitized with a solution made with chloro-platinite of potassium and ferric oxalate, to which a small trace of chlorate of potassium or chloride of mercury is sometimes added.

On exposure to light, the ferric salt is converted into the ferrous salt; this is the change that visibly takes place in the printing-frame. When, after sufficient exposure to light, this salt is dissolved in a suitable solvent, it reduces the platinum to the metallic state. Metallic platinum is a very stable substance, which resists the action of all acids, and does not alter under the influence of the atmosphere.

The solvent, or developer, most used is one consisting of a hot solution of oxalate of potassium.

After passing by this bath, the print is immersed in acidulated water in order to remove all the remaining traces of iron. Once the acid bath is colorless, a few changes in clean water complete the operation.

This process, now called the "hot-bath process," was invented by Mr. W. Willis

and I, for my part, am grateful to him for his discovery, for to my taste it is the process *par excellence*, and, in fact, the only one I work.

Lately, we had the pleasure to see this same gentleman bring before us a variation of this process, in which the hot developer is discarded. This process is known as the "cold-bath process." The paper is prepared with the iron salt alone, the platinum being added to the developer, which is used cold.

In this method of printing my experience is, so far, a very limited one, but what I have done shows me that it is equal, if not superior, to Mr. Willis's first invention. It has, perhaps, less softness, but it gives very brilliant prints, with very vigorous blacks. I should say that it is especially useful for the reproduction of engravings and similar kinds of prints, where a powerful black is required.

For the amateur who wants only a few prints at a time, it has a drawback; for, if the developing solution, which is rich in platinum, is not promptly used, the precious salt becomes so much waste.

It is claimed that this process gives greater latitude in exposure, and though I have seen this fact clearly shown in Mr. Willis's lecture in this Club, I must confess that such has not been the case in my hands. I found that the image came out almost as quickly as when using the hot-bath process, and, consequently, I had greater difficulty in controlling development. The image flashed out as soon as the liquid had touched it. On this I tried diluting the developer both with oxalate and with plain water, but the results were not satisfactory.

The above two processes, although so near perfection, have the drawback that, while printing, the progress of the image is only visible to a certain degree. The picture, when sufficiently printed and taken out of the frame, is but a weak shadow of the vigorous image that the developer will bring out. This has, to a great extent, deterred many amateurs from adopting this charming process, for they find a difficulty in judging the exposure. Workers who daily print in platinotype will, of course, tell you that the process is as easy as silver printing; but many of us lack that constant practice, and consequently spoil much paper, and often, in despair, give up the process altogether.

We must, therefore, acknowledge that Captain Pizzighelli has rendered us a good service with the introduction of a third method, in which the image becomes fully visible whilst printing, and its progress can be followed just the same as with ordinary sensitized silver paper.

The developing operation is no longer necessary; as, once the picture is sufficiently printed, all that remains to be done is to fix it in weak hydrochloric acid (1 of hydrochloric acid to 60 of water), and then wash it in a few changes of water.

Pizzighelli discovered that if one of the substances which is used as developer be added to the sensitizing solution, the platinum is reduced when exposed to light, under the influence of the moisture in the air.

The possibility of being able to print right out in platinotype at once fascinated me. It was not till later on that I was able to start the series of experiments, the outcome of which I have the pleasure to bring before you to-night.

Though very hopeful when I first commenced, I confess that inwardly I very much doubted that the same beautiful results could be obtained by the new process.

After a little reflection, I concluded that the most practical way of trying the

newcomer would be by printing from a variety of negatives. I accordingly selected eight negatives from among my small stock. You will see that there is a fair range of density and a variety of subjects.

Some are a little flat, others brilliant; some are thin, while others are strong and vigorous. In the one with a cart and a horse you will find a good example of an under-exposed and hard negative with very weak details in the deep shadows. If you look now at this negative you will see a large doorway represented by almost clear glass, and here I must remark that it is in such very deep shadows that the printing-out process has been most troublesome to me, and it is especially in this respect where the other two processes showed at first their superiority in a marked degree.

After obtaining as good a print as I possibly could from each of these negatives by the first two processes, I then tried some of the commercial platina-paper. In the series of prints which I shall presently exhibit, you will see the results I got with it; and I only have to add that the manufacturer's agent formally informed me that the sheets I had purchased from him were all out of one batch.

My further experiments were made on paper prepared by myself, following at first Pizzighelli's formula very closely, and then making the alterations and additions that I thought would lead to the desired result.

Pizzighelli gives out three ways of working this process—one in which the paper has to be sized previous to sensitizing; a second one where the developing substance is added to the sizing liquid; and the third method, in which the sizing and sensitizing are done simultaneously, thus saving one operation.

Although I strongly recommend the use of a well-sized paper from the first, I will here briefly sketch the above three methods.

In the first instance, the paper is coated twice with a two per cent. solution of arrow-root. From four to five drachms is about the right amount for a sheet 26 x 20 inches.

For coating either a bristle brush, a sponge, or a tuft of cotton-wool are suitable; but, personally, I much prefer using the latter, as it is easier and better to manipulate, and can be renewed for each operation.

The sensitizing is not difficult, but to begin with it will be advisable to try small sheets. The plan I adopt is the following one:

Once the solution is well and evenly spread over the paper, hang it by two corners till the surface moisture has disappeared. (Mr. Cembrano here sensitized a sheet of paper before the meeting.) It has been my custom, when arriving at this stage, to dry the sheet in front of an ordinary gas-stove, taking care not to scorch the surface of the paper; but by what I have experienced since then I think that drying before a fire can altogether be dispensed with, it being sufficient to hang the paper for some hours in the dark.

In most of my experiments, when I first began, I was greatly worried, sometimes with poor, flat prints, and a mottled and sunken-in appearance. At other times I found it quite impossible to prevent a sort of rehearsal in the deepest shadows of the image. These, instead of getting black, turned to a peculiar dark-brown color. To remedy this I tried varying the proportions of the different solutions, and then modified my method of sensitizing; but all to no avail. Ultimately I concluded

that the fault was due to a too-dry condition of the paper. I may here remark that I had been in the habit of storing the sensitized paper as soon as dry in the ordinary calcium tube.

Here are two series of prints—20 and 20A—prepared and sensitized exactly alike, and printed from the same negatives. In one case—those marked 20—I could not get a good, or even a passable black in the deep shadows, no matter how I prolonged the exposure or how I treated the prints after these were taken out of the printing-frame. This paper had been kept all night in a calcium tube, and was bone-dry when put into the printing-frame. In the second case—those marked 20A—the only difference in the treatment was that, instead of storing the paper in the tube, I left it all night in a cupboard, simply rolled up in brown paper, and then, before printing, I left the paper exposed to the atmosphere for one hour. You will doubtless notice the immense difference between these two series.

This leads me to the subject of damping the paper. Some say, "Steam it" before printing; others prefer to put a damp-pad in the printing-frame, behind the paper, while somebody else recommends to treat the print in various ways after printing, such as breathing on it, or leaving it for a short time in a damp atmosphere, or passing through a weak and cold bath of oxalate, or even immersing in plain water, previous to fixing. Well, I have tried all these recommendations, and got quite bewildered at the results. Sometimes I obtained the desired effect, whilst at others I could get no change whatever, and, what is still more puzzling, I found that under certain conditions the image lost in strength after damping—I am talking now of damping after printing, and before fixing. After repeated trials I came to the conclusion that if the paper is perfectly dry before printing, such practices as breathing, damping, etc., will produce an increase of intensity, and bring out details in the high lights which were not visible before. Coupled with this there is also a kind of continuing action. (See some examples. Nos. 16 and 18.) In this instance (those on No. 18) these series were only half-printed when night came, so that I was obliged to postpone printing till next day. I left them all night in the frames in a dry-room. You can now see how I found them on the following morning.

But if the paper has not been kept so very dry before it is put in the frame, damping or breathing will have little or no effect.

Let us now pass on to the preparation of the sensitizer. The various formulæ have already been published several times, so that I shall limit myself to giving you the proportions used in some of the experiments now before you.

Starting with Pizzighelli's first method:—After the paper was properly sized, it was coated as follows:—

A solution of chloroplatinite of potassium was made in the proportion of 1 to 8, and we will call this A solution.

B solution was made with sodium ferric oxalate 4 drachms, dissolved in 3 per cent. solution of sodium oxalate 10 drachms, and glycerine 15 ms.

C { Solution B=5 drachms,
  { 5 per cent. chlorate potassium, 25 minims.

For one sheet 26 x 20 { A=100 minims,
                      { C=140 "

In the next trial (No. 14) I substituted oxalate of potassium for the oxalate of

soda, but the results were not so good, the image being rather flat, and perhaps granular. It seemed, however, to print somewhat quicker.

Not having sufficient time to try this experiment again, I went on to the second method. Here I added the developer to the size, by dissolving the arrowroot in the 3 per cent. solution of sodium oxalate in the proportion of 2 to 100. After this sizing, and when dry, sensitize the same as above, dissolving the green crystals in distilled water instead of in the oxalate solution.

By the way, it is very strange that the streaky marks due to uneven coating show very pronouncedly whenever the paper is used too dry, or when the continuing action is resorted to.

Regarding the method just spoken of, the notes I made at the time say: "Very slow printer; irregular in tone, and patchy." This may be greatly due to bad coating, or to using too fresh a paper.

Nearly all, if not all the prints that I am showing to-night were made on the paper used by the Platinotype Company for their processes. In some cases I sensitized on the sized side, in others I used the obverse side. When using this paper, which is already strongly sized, the gum may be dispensed with, and this is an advantage, as it is far easier to coat when the liquid is thin.

Now we pass on to No. 3 Formula, which is the one Pizzighelli recommends.

The thickening substance, gum arabic, is added direct to the sensitizing solution.

The following is the way in which prints No. 20 (which I passed on a little while ago), were prepared:—

B { 3 per cent. sodium oxalate . . . . . 8 drs.
  { Sodium-ferric-oxalate . . . . . 3 "
  { Gum arabic . . . . . 2 "

C { Solution B . . . . . 2 drs.
  { 5 per cent. chlorate of potassium . . . . . 10 ms.

To sensitize 1 sheet 26 x 20 { B=90 ms.
                             { C=38 "
                             { A= 2 drs.

To prepare B, warm the sodium oxalate and dissolve in it the ferric-oxalate; then add the whole to the gum, which has been previously well pulverized. Stir well and allow to stand for some hours in order to get every particle of the gum thoroughly dissolved. Strain through cloth.

If the gum is not all dissolved and the liquid not strained, you will get these ugly patches, as shown in prints No. 1.

Now, with regard to sensitiveness, I must say that the printing-out paper is far behind the two other processes. In fact, it is dreadfully slow; but let us hope that means will be discovered to bring it up to the same rapidity as the ordinary platinotype process. I cannot well tell you how much slower it is, so much depending on the light, preparation, and hygroscopic condition of the paper. I will estimate it, very roughly, at from ten to twenty times slower. Here I may add that every print shown to-night (except in one or two instances) was done in a diffused north light.

With a desire to shorten the time of printing, I have tried adding various sub-

stances to the sensitizer, and have also used other substrata than gum and arrowroot. In both cases I have had, as yet, but little time to make many experiments.

Sizing the paper with gelatine or albumen has not satisfied me; but I have obtained very fair prints, with a slight increase of sensitiveness, by adding chloride of calcium to the sensitizer.

The series marked 19 was so prepared. While printing, the image has a dark bluish color, which, on fixing, becomes a good black, as you see. These are among the best, if not *the* best prints that I have been able to obtain in the printing-out process, and I think that you will agree that the difference between them and those done by the hot-bath process is slight, and requires close comparison to discover it.

The sensitizing solution was prepared in the same way as in the first formula given you to-night, when showing prints No. 13, with the addition of 4 grains calcium chloride in 40 ms. of distilled water per sheet of paper.

The next series, No. 21, were prepared in the same way, substituting for the calcium chloride solution three drops of a saturated solution of sulphate of iron and nine drops of a saturated solution of oxalate of potassium. This addition was suggested to me by Mr. J. B. B. Wellington. There was hardly any increase in sensitiveness, but the color is as good, though the image may be a trifle harder.

The following experiment has given also fairly good results:—No calcium chloride or ferrous-oxalate developer was employed, but, instead of taking 140 ms. of the C solution, I only had 90, and made up the rest with solutions A and B, as supplied by the Platinotype Company for their hot-bath process. (See print No. 22.)

Being curious to know what would be the effect of sensitizing a sheet of paper as for the hot-bath process, but with the addition of the developing agent, I printed Series 9 and 12. They look very fine, but I must tell you that they had to be developed hot, as they would not print out.

Almost all my experiments were confined to the black tones, but here are a few sepia prints, which were made according to Pizzighelli's instructions.

In conclusion, let me assure you, gentlemen, that I have tried each process in the fairest and most impartial way, my only object being to find out what could be done with each, and which was the best. I have tried, to the best of my ability, to show you the working and the capabilities of each. Let each one make his choice, and, whatever this be, I feel sure he will never repent, for a platinotype print will be to him a thing of beauty and a joy forever.

SOME RECOLLECTIONS OF A DEVELOPING GLASS.

I AM not really a developing glass at all, but a medicine glass, and a very common one at that. I am not made of fine European crystal with the ounce, minium and drachm marks exquisitely engraved, and snugly fitted into a nice little leather case with a lid to it. No; I am a plain, ugly vessel, with a lip flared all around, holding rather more than two ounces when filled, and bearing four marks, indicating one-half, one, one-and-a-half, and two tablespoonfuls respectively. I stand on a remarkably solid base, which is, at least, six or eight times as heavy as my sides, so that it takes quite a violent push to upset me, and my inside is smooth and round, par-

ticularly at the bottom, where there is no chance whatever for dirt or chemical deposits to gather and remain. A single wipe with the tip of the finger removes any scum that may have collected, and sets me in working order. My favorite motto has always been, "Cleanliness is next to godliness." I have at various times heard about such substances as oil, grease, varnishes, gums, etc., but I know nothing of them; not one of them has ever been put into me, and I am acquainted only with aqueous solutions, alcoholic extracts of different kinds, and pure water, not to speak of the active detergents, such as chromic acid, nitromuriatic acid, caustic alkalies, etc., to which I have been treated now and then when more than usually dirty.

My first recollection of being put to practical photographic uses, is in my owner's dark tent, at Lake George. Singular things used to happen in these pre-gelatine days, sometimes, and I remember that once when my services had been called into activity during the greater part of the day, and some excellent work done, I, together with an immense nitrate of silver bath, was suddenly thrown on my side, our contents mutually escaping and mixing with the collodion, etc., whose containing vessels had been smashed by the same fall that upset us. In short, a violent squall of wind had struck that part of the island where my owner's dark tent had been pitched, and over it went, creating a general "wreck of matter and crush of worlds" among the glass and chemicals. This was but one out of the many times that I suffered an overthrow, but somehow or other I survived them all, and am still as whole and sound as I was when I left the factory. It may be that something of this is owing to my usually having been set on a board right on the ground, so that when upset I had no distance to fall,— indeed, sometimes, I have been simply rolled over into a tuft of grass or moss so soft and pleasant that I have doubted whether it might not be well to spend the rest of my days there in luxurious idleness. Had I had my own choice in the matter it would probably have been so.

After some varied experiences at Lake George, my services were again called upon later in the summer in photographing the wild scenery along the upper part of the Lehigh River in this State. A large portion of this work, one negative from which, by-the-by, was honored with the medal of the Photographic Society of Philadelphia, for December, 1870, was done in the immediate neighborhood of Mud Run, an insignificant place enough, but one which has lately acquired a sad notoriety from the disastrous railroad accident that happened there. Many a beautiful glen and stream in the Lehigh Valley have I been along; indeed, I distinctly remember one breathless scramble my owner made (with me in his pocket, carefully wrapped up in an old stocking-leg), up the almost perpendicular mountain side, over huge boulders slippery and wet from the numerous waterfalls, and carpeted over with ferns and wild plants. I was expecting every moment either to be smashed to pieces as his coat-tails swung against the rocks, or to be unrolled, set in the tent and filled with developer as usual. Nothing of either sort took place, however; the ground being so steep and rough that there was absolutely no available spot upon which to pitch the dark-tent. Anybody who has visited the famous "Glen Onoko," just above Mauch Chunk on the Lehigh, will not be surprised at what I am saying, for it was over this very place that my owner carried me, as described, and this was long years before the idea of turning the beautiful wild spot into a tourist's resort had occurred to any one.

The following summer my duties were much the same as before, but the images which appeared upon the white collodion film made it evident that my owner was engaged upon a quite different class of landscape subjects. My knowledge of the photographic results I have helped to produce is, of course, limited to the negatives; these I could at times scrutinize pretty closely, as I was held close to the plate in my owner's hand, and in time I became quite a good judge of the good and bad qualities of the negative. The negatives I now speak of showed fine distant ranges of mountains, with smooth meadows or rivers rushing over stony courses in the foreground. Natural clouds, too, often appeared in the picture, and from odd bits of conversation overheard, I learned that my owner attributed his success with clouds and distances to his plan of shielding the upper half of the lens during the exposure of the plate, thus giving the dark details of the foreground time to impress themselves on the film, while the highly lighted distance and clouds were kept back. During this year that I speak of, and throughout several subsequent ones, we were in the beautful White Mountain region of New Hampshire, and I did my full share of the work at the Lead Mine Bridge on the Androscoggin River, in the meadows of North Conway, at Chocorua Lake, in the valley of the Pemigewasset, in the Crawford Notch, and numerous other picturesque places.

I have, in fact, done quite a deal of traveling in my time, and have crossed the Atlantic several times. Of what occurred on shipboard I know but little, as I was, as usual, packed in a stocking and stored away in a stove-pipe hat, together with various bottles of pyro, alkali, nitrate of silver, etc. I became quite familiar with European hotel bedrooms, and have seen my owner turn wash-hand basins into sinks, and pitchers into watertaps, in quite an effective manner. And after being used I have often been washed out with water harder than the heart of Pharaoh himself; so that I used to wonder how the negatives bore the lengthy washings necessary to their permanency. This I found was provided for by certain bottles of distilled water, that I always observed had their place on the wash-hand stand, beside the pyro and other chemicals. It is hardly worth while for me to say that all dry-plate developers I ever held were made with distilled or soft waters only.

The most disagreeable portion of my work was to have to stand for hours, or sometimes for days together, in the iron sink, when I probably had been forgotten, and do what I would to keep clean I could not avoid contracting some stain from the iron. I was, however, almost always treated to a bath of strong muriatic acid after such a spell of service, which removed the iron stains quickly and effectually. Another thing almost as disagreeable to me was to be left on a shelf or working table near the sink, that was rotted through with chemicals and always sloppy from the drippings of plates. At these times, if hurriedly picked up to develop a plate, I used to struggle with might and main not to let drops of the filthy slop from the work-table, which I could not fail to carry up with me, fall on the negative and spoil it. It was no easy matter not to do this sometimes, but I generally succeeded. I always was glad to see the rubber squeegee brought out, and the table on which I was standing well scraped off. I then felt clean and ready for work.

Although now many years old I, like my owner, still preserve an active interest in photography. I understand that my place is now pretty generally filled by a flat

dish to hold the plate while being developed. This is no new thing, as I once heard while in Europe; many good photographers having used the dish for developing collodion plates, because the results were clearer and there was less liability to markings and stains. But I also heard that unless the collodion and bath were of the kind that gave great density, this plan was not a good one, because the free nitrate of silver on the plate from which the negative image was built up became too much diluted, and the negative, in consequence, poor and thin, like many of the over-exposed and under-developed gelatine plates of modern times.

For the immediate present I am shelved, and have returned to my original purpose as a glass in which to measure medicines. But so strong is the habit formed by early training, that I can never regard myself as anything other than a photographer's developing glass, and not all the black and noxious draughts that the druggists' art could combine would ever make me forget the sparkling developers which were my first acquaintances among liquid things, nor the jolly life in the portable dark-tent in which I have so often partaken.

HELIOS.

ON THE PRINTING DENSITY OF NEGATIVES.

Paper read on Thursday, Oct. 25, before the London Camera Club, by Mr. Lyonel Clark.

A FULLER title than above will, perhaps, better explain the scope and intention of the present paper. The point I especially wish to raise discussion on is the particular quality of negative, as far as regards the thickness and gradation of deposit, that will best suit the different printing methods most in vogue.

We, of course, all know that a considerable latitude in the character of the negative can be compensated for by skill in the manipulation of the chosen positive process; but it is not in my province to-night to go into that. I merely wish to ascertain the particular average quality of negative that will give the best print on any desired positive process, this latter being worked strictly in accordance with instructions—mechanically, so to speak.

Let us consider what a negative really is. When light, followed by a developer, acts on the sensitive film, we know the film is darkened; if the light be stronger, or the time of exposure longer, the darkening of the film will be greater, and, within certain limits, the longer the exposure the darker the resulting deposit. So that, given a correctly-exposed negative of a well-lighted scene—that is, one giving a good gamut of tones between the darkest shadows and the highest lights—the negative of this scene will, under development, go on darkening proportionately up to a maximum point, that point being limited by the nature of the film. Now, I may say that even on the thinnest and most starved plate, with a sufficient exposure, this maximum amount of darkening will be too great for almost any printing process.

I know that it is a common complaint that it is with many plates almost impossible to obtain density; but this is really due to under-exposure—the light has not had time to do its full work; at the same time, it is, of course, possible to get a thin image through over-exposure; that is to say, the high-lights may have suffered partial reversal, a well-known concomitant of over-exposure. But, as a rule, thinness will be found to result from under-exposure.

It is a common thing to say, looking at a thin negative, that it is over-exposed; and looking at a hard black and white negative, that it is under-exposed. But this is only correct in part. In the over-exposed negative we could have got any reasonable amount of density, but, unfortunately, it would have been nearly equally dense all over; for in all such negatives the deepest shadows will probably have received a sufficient exposure for them to blacken up to the full density of the high-lights, which may even be reversed, or partially so, and consequently, on development, fix out thinner than the half-tones, and the picture would tend to print out wrong way about. We practically know that by continuing the exposure long enough we can reverse the whole image and obtain a positive from a positive or a negative from a negative.

On the other hand, a hard black and white negative is not really black because it was under-exposed; on the contrary, those parts which have been developed black were at least fully exposed, or they would not have blackened to that extent. What has really happened is that we have allowed, whilst waiting for the under-exposed shadows to come up, the higher lights to obtain too great density, and the resulting negative is too dense or hard.

But even in the case of a correctly-exposed negative it is possible to get a very great variation in density. We have seen that the density depends on the thickness of the deposit left in the gelatine film after fixation. Now, if we imagine the molecules of which the deposit is made up to be bricks, we can say that in the thinnest part it is one brick thick, in the half-tones ten, and in high-lights twenty bricks thick, and so on; and we can lay out a diagram, in which the number of bricks will denote the thickness of the deposit, and if we build up the number of bricks corresponding to a certain time of exposure or intensity of light, which is the same thing nearly, on a line representing that exposure, we can draw out a curve giving us the value or thickness of deposit due to any particular exposure.

The curve I show you is taken from a sensitometer plate, prepared by Captain Abney, made after Mr. Spurge's method.

Here the vertical lines represent equal increments or periods of exposure or light intensity, and the vertical line shows the amount of density that the plate received from that exposure.

Now, let us expose a piece of sensitive paper behind such a sensitometer, and watch its behavior. The paper under the thinnest square, will commence to darken at once, that under the next dense will then commence to show signs of exposure, and so on, square after square. Now, after a certain time, the paper under the thinnest square will have obtained a maximum blackness, beyond which it is not capable of going; the only effect after longer exposure will be to bring the portion under the next square up to an equal blackness.

On examining the paper under the rest of the squares, we shall find one square under which the paper remains uncolored, the opacity of the sensitometer at this point having been sufficient to stop all light action.

We could, of course, by a longer exposure, get this square and the next, and, indeed, every square, to print out, but what would be the result? At the opposite end of our sensitometer the paper under all the lower squares would have darkened up to a uniform blackness. This is certainly not a desirable effect, for if our sensitometer were a negative of a picture, it would mean that all the detail in our shadows would have been brought up to one density and so destroyed.

Therefore, as soon as the clearest part of our sensitometer screen, equivalent, of course, in our negative to the deepest shadows, has let enough light through to darken our print to the utmost blackness required, we should at once stop the exposure. I am, of course, imagining that the process used will not lose any of its intensity or blackness by after-treatment.

Now, on examining this print we have a clue at once to the density that our negative should have; in fact more than a clue—an absolute and infallible guide. For it is very evident that if any portion of our negative is denser than the particular square which, in the above experiment, left the paper under it uncolored, or nearly so, we shall not get it to print out at all, unless we allow the bottom squares to become over-printed and uniformly black. On the other hand, if we stop our printing when the first square, that is the thinnest one, gives us no maximum blackness, the details in the high-lights will not be represented on the print, but show large patches of white.

We are therefore fixed between these two points, and all prints from a negative which has a greater range of gradation, or, what is the same thing, a deposit denser than the critical square of our sensitometer screen, which we saw limited the darkening of our sensitive medium, will be useless for the particular positive process we are using.

Some sorts of paper may show a wide range; that is they will show many intervening squares between blackness and whiteness, and the curve if plotted out will be long and flat, whilst other papers may show but little gradation between the two extremes, and their curve will be short and sharp. Of the former kind we should at once say that it requires a denser negative, that is, one having a long gamut of gradations, from clear glass to a most opaque deposit, to get the best results. Of the latter we should say that it requires a thin, delicate negative, with but slight gradations between the shadows and the high-lights. If we know the light-resisting power of each separate square of our sensitometer, we can, by exposing under it the particular positive process we wish to examine, and noting the difference between the squares corresponding to white and black on the print, mathematically express the maximum density and range of deposit that our negative should have to suit the process under examination.

I propose to examine with a sensitometer the particular density of deposit that will best suit the following printing processes:—

IN PRINTING-OUT PAPERS.

1. Ordinary albumenized.
2. Plain salted paper.
3. Obernetter sil.-chloride.
4. Platinotype, developed hot.
5. Platinotype, developed cold.
6. Willistype, X or brilliant paper.
7. Willistype, Y or soft paper.
8. Pizzitype.

OF DEVELOPABLE PAPERS.

9. Ilford rapid bromide.
10. Ilford slow bromide.

11. Ilford alpha bromide.
12. Fry's argentotype.
13. Eastman's bromide.

and I propose to try and determine the particular kind of negative that will best suit each of the above printing processes, working these processes strictly according to their instructions, and using an average light. I mean by that for printing-out processes an average diffused light, and not sunlight, and as regards developable papers an ordinary gas-light, not lime or magnesium; for the value of the light has a very important bearing on the nature of the curve of intensity: indeed, this phenomenon is well worth much more serious investigation than the scope of this lecture allows. Practically it is known and admitted, for every beginner's book tells you to print a dense negative, that is one with a slow intensity curve, in the sun, whereas a weak negative, that is one with a rapid curve, is to be printed in a very weak light.

Although not generally so admitted, this is equally true of negatives, and the effect on a dry plate of a short exposure with a large stop is not the same as the effect of a long exposure with a small stop. Although the light be constant, the product of the "light intensity by exposure" is certainly the same, but not the effect as regards reduction of the silver salt. I mean thereby that an exposure of 1″ with a $\frac{1}{8}$th stop is not equivalent to an exposure of 64″ with a 1-64 stop, although, by calculation, the product of the two will be the same.

The action of a fogged negative on printing-paper is a similar phenomenon. If it were not so a fogged negative should print exactly the same as a clear one, only requiring a longer time—that is supposing the negative has proper gradation—for then the fog would only represent the addition of a light-resisting deposit over the whole negative equally. Even different samples of gelatine may affect the prints. Every one knows the good printing qualities of a collodion negative, for this vehicle is particularly clear in the dark shadows, whilst, at the same time, the deposit that corresponds to the high-lights is also more transparent.

These differences of foggy images, muddy gelatines, etc., are, I admit, more scientific than practical, and not likely to cause trouble; but still the differences undoubtedly do exist, and all who have had any experience must have remarked how often certain negatives will give better prints than others.

Coming again to our point, the proper sort of negative for each process. Is it to be a thin or a dense, hard or soft one?

I had, perhaps, better state here precisely my interpretation of the usual qualifications applied to negatives. Beginning at the bottom of the scale, I call a negative thin, feeble, or weak—one which has no gradation between the lights and shades—in fact, an over-exposed, undeveloped plate. A flat negative would be the next stage,—that is a fairly good negative, but not quite strong enough in the high-lights. We then get the good negative, usually qualified with the adjectives, "bright," "sparkling,"—that is, one properly exposed and properly developed. Going further on, a negative will be called, first "brilliant"—this generally signifies that density has been slightly overdone,—then "hard," or "black and white," generally signifying a negative that has been under-exposed in portions and over-developed in others, commonly called an "under-exposed negative."

We then get the "dense negative;" this is one where, although exposure is correct, or erring on the "over" side, development has been carried on too far, and the high-lights have obtained the maximum blackening that the silver salt is capable of assuming. The deepest shadows will be full of detail, not fog; and there may not be even small portions of clear glass. The same result will generally be got by over-intensifying a brilliant negative.

The last kind of negative must not be confounded with a foggy negative—a condition that can obtain with any of the above types, and will alter the printing rate or rapidity of the negative by reducing the light intensity, and, therefore, indirectly affect the intensity curve of the negative; in fact, the result will be the same as printing through a colored glass, which has the effect of hardening the negatives and giving a longer and slower curve. All who develop with dry pyro and ammonia know how thin these yellow-stained negatives may appear, and yet give most excellent and vigorous prints.

The following sets of proofs are the results obtained from my sensitometer, and on the blackboard they are laid off in curves; but these curves must be more or less unintelligible to the majority, and some explanation will be necessary. I must presume some knowledge of negatives on the part of my audience, and I will, therefore, take as a good basis the quality of negative that will give a good silver print. Silver-printing is, I think, the most generally practised, and most of you are, therefore, likely to know the gradations of negative that best suit this process.

Taking, then, a good silver printing negative as our standard, we will assume that the number of gradations of tints from the clear shadows to the densest high-lights of our negative to be 100. Then from the mean of several experiments I find that *plain paper* requires eighty-three gradations.

Obernetter paper, on the other hand, requires 108 gradations. This is, that a negative suitable for plain paper should be less dense than one suitable for silver, whilst a negative for Obernetter's gelatine-chloride paper requires a denser negative than a silver one. It is, however, difficult to accurately gauge the results of these papers; owing to the sunken appearance of the image in plain paper and the h gh transparency of the Obernetter paper, comparison is not very accurate.

Of the *platinotype* papers, the ordinary process requires as nearly as possible the same quality of negative as a silver print, providing the shadows are clear; if any fog be present a very much denser negative is required; indeed, if much fog be present, it will be nearly impossible to get good results.

The *Pizzitype* requires an exceedingly dense negative if anything like absolute black is required,—some 300 or 400 gradations at least.

Of Mr. Willis's new papers, or *Willistype*, as I will call them, the X or brilliant paper requires a negative less dense, the proportion being as 80 to 100, whilst the Y or soft paper will take a negative twice as dense, that is, with 200 gradations.

Comparing, now, the developable papers, we find that *Fry's argentotype* requires the thinnest negative—one equal to about sixty-six gradations; the Eastman next, with seventy-seven gradations. The *Ilford rapid* gives the same result as the Eastman; whilst their *slow paper* requires a slightly-denser negative,—one equivalent to eighty. Lastly, the *Alpha* gives the best result with the same negative that will give a good silver or platinum print. This latter paper, however, owing to its peculiar

composition, is very difficult to classify. By varying the quality of the light to which it is exposed, an endless variety of curves may be obtained, *whilst variation in developer produces many more.* Resuming the whole of the above, we may say that a good, fair negative will give us, without any dodging or manipulation, good prints, equally, on *albumenized, plain-salted, Obernetter, platinotype,* and *Alpha* papers. For a thin negative we should use, if very thin, *argentotype,* then *Eastman* and *rapid Ilford,* then the *slow Ilford,* and of the printing-out papers, *Willis's X paper.* On the other hand, for dense negatives, the only developable paper likely to give good results, without dodging, is the *Alpha.* Of printing-out paper, the ordinary *platinotype,* fully exposed and developed cold, gave good results with dense negatives, but this cold development rather comes under the head of dodging. *Obernetter paper* was also suitable, and for very dense negatives the Pizzitype and Willis's Y paper.

As a sort of proof of my deductions, I have also prepared a series of prints from negatives, which may be classed under the head of thin, brilliant, and very dense. The Willis X paper appears to me to give the best results with the thin one, whilst the Willis Y gives the best result with the dense ones. Of developable paper, the Ilford slow and Alpha give the best results with the brilliant negative. But it must be clearly understood that these papers are treated mechanically, exposed, and left to develop up to maximum density, etc.

Whilst on the subject of these papers some remarks on their relative rapidities may be useful. It is quite clear that by the system I have used in my experiments, the time of exposure has no effect, the curves being simply measured from the density of deposit, and not from the time the light acted. But it was, of course, necessary for me to find out the relative rapidities, and I give them to you. We can measure the rapidity of a plate in several ways—by exposing it under a sensitometer to an equal light for equal time, and noting the last square of the sensitometer readable; or the system I prefer and have used, of exposing it to a constant light for different periods of time, and comparing the periods necessary to produce a maximum darkening of the film.

I find the following rapidities, assuming Ilford rapid as a standard, requiring 10 seconds exposure at 2′ 6″ from a ten-candle gaslight. Then—

Eastman will require	30″
Argentotype	60″
Alpha bromide slow	240″

We now come to the question of the best kind of paper for enlarging upon. This is a question that must so much depend on the intensity and quality of the light at one's command, that it is extremely difficult to lay down any rules.

But, speaking generally, it may fairly be stated that a thin negative should be used, as in London at least one rarely has too good light; and with artificial light a thin negative is almost imperative if paper be the medium used to enlarge upon.

If, however, a somewhat dense negative must be used, then the most rapid paper obtainable should be used, such as Ilford rapid, or Eastman, or Fry.

It must, of course, be understood that the quality of the different papers under consideration is not touched on in these experiments; that must be a matter of individual taste.

Having done my best to settle the amount of densities which the negative should have, a few words are necessary as to the method of obtaining this amount at will. To describe this in words, I am, I confess, fairly nonplused. Every different brand of plates gives different appearances under development. Generally speaking, it is safe to see the image well out on the back before stopping development, but, of course, watching the effect by transmitted light is the best, although difficult.

I can only recommend beginners to experiment; let them throw away a dozen plates on a subject, giving the same exposure and same developer, but stop development at different stages, noting carefully the appearance of the image; after fixing, expose the resulting batch at one time over the particular paper they intend to use, and, noting the one that gave the best results, put it aside for future reference, and always try and work up to it.

I feel assured that the time expended will not be wasted, for it is only by careful experiment that you will quickly obtain an accurate knowledge of the correct printing density of negatives.

THE PHOTOGRAPHIC SOCIETY OF PHILADELPHIA.

A STATED meeting of the Society was held Wednesday evening, December 5th, 1888, the President, Mr. Frederic Graff, in the chair.

The Secretary reported the receipt of a circular letter announcing the formation of the Photographic Club of Paris, composed of amateur photographers, who propose to celebrate the opening of their rooms by an exhibition on December 15th, to which members of this Society were invited to contribute albums, prints or negatives. An invitation was also extended to members visiting Paris, particularly during the Exposition of 1889, to make use of the Club's laboratories, dark rooms, etc. A vote of thanks was tendered to the Photographic Club for their courtesy.

The Joint Exhibition Committee reported that a meeting of the Joint Exhibition Council was held in New York, on November 10th, at which certain alterations and amendments were made in the rules, etc., which experience had indicated were desirable, and which it was thought would contribute greatly to the success of future exhibitions. Preparations for the forthcoming exhibition in Philadelphia, during the Spring of 1889, were now in progress, and circulars with rules and other particulars would shortly be issued.

Mr. Rau, Director of the Lantern Slide Interchange, announced that the slides from the Pittsburgh Amateur Photographers' Association would be shown at the Conversational Meeting, December 19th.

The amendment to the By-Laws proposed at the November meeting, providing for a Standing Committee on Lantern Slides, was taken up for consideration, and adopted as offered.

Nominations for Officers and Standing Committees for 1889 were made.

On motion of Mr. Coates, it was resolved that the Treasurer issue as a receipt of dues paid, a ticket of membership, stating that the holder is a member in good standing for the current year, and stamped with the seal of the Society.

A paper was read by Mr. Henry Harrison Suplee on "The Largest Camera in

the World," being a description, particularly in its application to astronomical photography, of the Lick Telescope.

Mr. Suplee also presented to the Society on behalf of Messrs. Warner & Swasey, of Cincinnati, the builders of the telescope, three fine photographs showing the instrument as mounted in the observatory.

A vote of thanks was tendered to Mr. Suplee for his interesting paper, and to Messrs. Warner & Swasey for the photographs.

Dr. Charles L. Mitchell gave an interesting account of a photographic trip taken during the last summer in the White Mountain region of New Hampshire. A large number of excellent slides were shown as the result of the trip.

Mr. Carbutt showed some transparencies made on his new Flexible Negative Films, which were of great beauty. They were mounted between two sheets of plain glass, no ground glass being required. An excellent portrait negative, made on a film by Mr. Gutekunst, was also shown.

As a convenient method of using the films in ordinary holders, Mr. Carbutt showed some carriers made from sheets of ferrotype plate, the edges being bent over in such a manner that the films could be readily inserted, and firmly held so that the carriers could be placed in position in the holder.

He called attention to the absence of halation when films were used, the smallest twigs and branches of trees being perfectly sharp. Negatives taken in the building of the American Institute Fair in New York, a portion of the skylight being included in the view, were entirely free from halation when taken on the films, the decided reverse being the case when glass was used.

In reply to a question by Mr. Burroughs, it was stated that the tendency to curl in drying could be obviated by first placing the film for three or five minutes in a mixture of water 30 oz. and glycerine 1 oz.

Adjourned.

ROBERT S. REDFIELD, *Secretary.*

GLIMPSES OF MOUNT DESERT.

MOUNT DESERT ISLAND lies off the coast of Maine, about thirty miles southeast of Bangor. It is fourteen miles long by eight wide, irregular, and broken by frequent bays and indentations.

It was first settled in 1613, by De La Saussaye, with twenty-five colonists from France, but this colony was afterwards broken up, and the first permanent settlement was made in 1761 by Abraham Somes, at the head of the sound that bears his name.

Champlain writes in his notebook (autumn of 1604), "This same day we passed quite near an island, which is some four or five leagues long, and were nearly lost on a little rock just under water, which made a small hole in our bark near the keel. The island is very high, and so cleft in places that at sea it appears as if seven or eight mountains were ranged side by side. I have named this island 'L'Isle des Monts Desert,' the isle of the Desert Mountains."

As our little steamer drifted away from the island last summer, we could realize the first impressions of the French navigator. Bleak and blear seemed the sun-lit peaks as they stood out in sharp silhouette against a cloudy sky. A nearer acquaintance, however, reveals anything but a desert. The island is densely wooded, and the

valleys and hillslopes a mass of verdure. Nowhere, in so small a space, is concentrated such a variety of scenery. In one short hour the visitor can pass from the gay whirl of society to where the sea is beating against the rocky cliffs, to sequestered woodland nooks and smiling meadow lands, or placid mountain-locked lakes. It is a paradise for the photographer, only your stock of time and plates needs to be unlimited. Armed with a quick shutter, to climb out on the rocks overlooking the ocean, and catch the waves chasing each other and breaking in foam at your feet, is a never-failing source of amusement. The writer's ambition was to catch them after a storm, but the storm did not come, and he had to content himself with the milder breakers given in our illustration. This was taken on the eastern coast, near Schooner Head; it is instantaneous on a Harvard 25° plate in bright sunlight. I employed a Darlot Lens and Packard's Improved Shutter.

As illustrating the strong light reflected from the rocks and water, as well as the marvelous quickness of modern plates, I have an instantaneous negative of the "Spouting Horn," made *in a fog* on a Cramer 35° plate, which is declared by experts to be over-exposed. It is certain that it was thin, though the detail was good and brought out clearly by intensification. Only those who have experienced a New England fog will appreciate the nature of a light at such a time, and the apparent uncertainty of getting any picture, much less an instantaneous one. This "Spouting Horn" is a very curious rock formation. A cave has been worn by the action of the water, and into this the waves rush with great force. The back of the cave is a vertical wall, with a cleft or seam at the top, through which, in time of storm, the imprisoned waters shoot to a great height, thus giving it its name.

The views along the eastern shore have been opened up very much by the completion last summer of the "Atlantic Ocean road," which enables the visitor to closely follow the coast from Bar Harbor to Otter Cliffs. This is the finest part of the island for wave and rock effect, and the number of beautiful pictures is innumerable.

Mt. Desert is, as has been said, a collection of mountains; the highest peak is Green Mountain, which rises almost from the sea seventeen hundred feet. From its summit, which is reached by an inclined railway, the island is spread out like a map below you.

To the east are the lower peaks of Dry and Newport Mountains, sloping away like foot-hills to the sea; and fifty miles off, as the gull flies, Mt. Desert Rock and its light-house are visible on clear days with a glass.

Farther north the little specks below you are the houses of Bar Harbor; beyond it the rolling surface of the island, and in the distance the mainland and its far away mountains.

Looking westward, almost at your feet, is the beautiful Eagle Lake, walled in by Sargent's Mountain and "The Bubbles," and then the long stretch of Somes Sound which almost divides the island in two, and beyond innumerable hills and valleys you see the ocean washing the western coast. Southward is again the sea view, dotted with islands, among which the little steamer from Rockland is wending its daily course.

Such are a few of the views which are too distant for the camera to do justice to, but which, on the mind's retentive negative, remain as perfectly "fixed" pictures, and will long remain in our retrospect of this delightful resort.

ALFRED E. MARIS.

REPORT OF THE PHOTOGRAPHIC SECTION OF THE ROCHESTER ACADEMY OF SCIENCE.

ON November 20th, the Academy of Science Hall was filled to an uncomfortable degree by the members and friends of the Photographic Section, to witness the lantern exhibition of slides made by the section in charge of President Croughton.

The exhibition showed excellent work, and was enjoyed by all present. Among the members exhibiting were President Croughton, H. W. Mathews, E. W. Horn, Jas. Streeter, J. F. Hovey, C. F. Hovey, H. H. Spencer, S. H. Lowe, W. B. Pickard, C. Kerrigan, R. H. Gilbert, and E. E. Bausch; also a very fine series of slides by Mr. John Bartlett, of Philadelphia, which were greatly admired.

At the next meeting, President Croughton will read a paper on flash-light photography.

JAMES STREETER,
Secretary.

AN AMATEUR'S BARGAIN.

AN enthusiastic amateur photographer, one of the sewing machine agent and book convasser type, passing along a down town street in the City of Brotherly Love, not long ago, noted for its abundancy of what are known as "second-hand shops," had his attention attracted to a photographic lens, which was carelessly thrown in among other merchandise exposed in the window. Visions of a "Ross" or "Dallmeyer" for a song at once rose up before him. He was met at the open doorway by the affable merchant, with a pleasant "Goot mornin', mein freint, vot can I do for you dis mornin'? Valk rite in; I sells you a suit of close, sheaper as sheap, I buys dem close yisterdey von a Valnut street shentleman vat goes to Neiw Yorick in a hurry." He was answered with the question as to the price of the exposed lens. "Mine frendt, I sells you dot ting fur den tollars." On inspection the tube proved to be in perfect condition, and, judging from the inscription, it contained lenses of one of the most celebrated English makers. While the amateur was examining it the merchant kept on, "Mine vife advanced a young man den tollars en de tings, so he culd git marriet. I makes notting on de ting. I luse mine intrest. Mine vife is too gute harted." The amateur here turned to the dealer and carelessly asked him, "Where is the cylindrical obscurer which belongs here?" pointing to the end. "De vot you say?" The question was repeated, with the addition of calling his attention to the opening in the tubes for the stops, and asking for the "graduated perforated diaphragm" which belong in here. The dealer, seeing his visions of a good sale diminish, called his wife to the rescue from her perch in the rear of the shop, "Mrs. Isaacstein, Mrs. Isaacstein, you comes here once, quvick." The wife came quickly with a "vot you vants, Maushel." "Vell, Mrs. Isaacstein, dis shentleman he say das de—shust dells her, plese, mister, vot you say vos luset von dis tings." The request for the "cylindrical obscurer and perforated diaphragms" was again gone over, to the mystification of the Shemetic Eve, who said, "Vy, Maushel, de man vot I gets de tings von, tols me tat it dakes fotografs all rite," but mine frent, ven dot vot you says is troo, vat you gifs." "Well," said the amateur, "it is of no use whatever to

me without the caps and stops; however, for what you have here I will give you two dollars, and run my risk of getting the missing accessories." "Make it fife, mine frient; it coste me den tollars." "No, two dollars is all it is worth; look and see if you can't find the rest of it, and I will talk then." "I dells you vot, shentlemens, Mrs. Isaacstein I dinks was sheated in dot 'schacher,' drate is pat, ant I vants to sell, I got to life, give me four tollars and a halluf, und you dakes de tings avay mit you. I nose you vas a shentlemans so soon as I sees you in de street." "Two dollars and a half, and not a cent more." "Mein freint, I dells you the troot, dis vas der 'Shabbas,' unt Mrs. Isaacstein she gife den tollars on de tings. Dis vas strate, und makes no mistakes." "Well, I've got no time to spare. Will you take three dollars for it or not? Say the word," and buttoning up his coat the buyer started for the door. "Say, mein freint, you makes it dree unt a halluf unt it is a drade. Tont pe hard unt I drows in von of dem shenuvine varrented eighteen karat sillikey neckties vot you sees in the vindow dere. I nose you vill pe a gute gustomer." To end the matter the amateur reluctantly counted out the money, while the seller kept bewailing his bad luck in not having the other parts of the thing, and thus losing "six tollars and a halluf kash money," and all, as he said, by his wife being so good hearted and dumb. After the exit of the customer, Mr. Isaacstein, looking regretfully at the money in his hand, called his wife. "Mrs. Isaacstein, you vas neffer lissen do me oder learns annydings. Vas dit I dols you ven I gomes in yesterday unt you dolls me vas you puys unt shows me dot dings, unt tells me you gif dos plack feller a hole halluf von a tollar for de fortagraf mashene. Ven you tont lerns besser as dot I go 'Macholler' before as I buys goots genug to makes it vort vile. You see I only gets dree and a halluf for de tings and hafe to droo in a necktie. Rememper das, Babette, unt do petter de next times: den you gifes no more as a quarter, unt makes him dakes dat ous in drade, no cash money." "All rite, Maushel," was the only response of the dutiful wife.

The amateur, clutching his acquired prize, hurried northward to his home, chuckling to himself how he had bamboozled the guileless Hebrew with his smartness. Visions of success already rose up in his imagination as he walked along the busy street. Plans for trips to country and sea-side, with marvelous results from the new lens,—such as prize pictures; the medal of his Society; flattering notices in their journal; then the envy and victory over his photographic rivals,—all followed each other in quick succession in his active brain. While so engrossed in his meditations he plumped squarely into a pedestrian coming in the opposite direction; looking up as he excused himself and begged pardon, he found himself in front of a well-known optical establishment, when it at once occurred to our amateur to go in the establishment and find out the value of his acquisition. Handing the apparatus to the attendant with the inquiry as to the lowest price for which they could duplicate the lenses, the optician, after a glance at the bargain, handed it back with the information "that they did not deal in window glass." The amateur, thinking the attendant was joking, indignantly called his attention to the name on the tube. "Oh! that's all right," was the response, "the tube is all right, but the lenses have been taken out and common window glass substituted,—that's all, sir," at the same time showing our smart amateur that there was no focus to his purchase. It was now his turn to stand aghast; all of his dreams and plans had been dispelled in that instant, so thanking

the optician for his trouble, he left the store and again wended his way up the street; however, his step was less elastic, nor did he hold the package so tightly as he had before; different thoughts occupied his mind; first, silent maledictions were heaped upon the head of the wily descendant of Shem who had sold him the bargain which had so buoyed up his expectations, while photographically our amateur concluded that his old compound convex-double-polished-achromatic Waterbury in his outfit was good enough for him in the future, and if only the plates were all right, the pyro good and the hypo pure, he could make as good prints as anyone in the Society. As a matter of fact, he was three dollars and a half out, but was in — a brass tube, two round disks of plain glass, and all of his experience.

To return to Mr. Isaacstein: after his wife returned to her perch in the rear of the shop, he went to his rickety desk with the proceeds of his sale, muttering to himself, "Dot feller dinks he vas schmart, makin' fun mit me vid his pig fool vorts,— I don't tink he vas come pack mit de fotografs vot he dakes mit de dinks; de schmartest tink vas dat I hold mein tongue und dells Mrs. Isaacstein noting how I dakes out de linses, unt sells dem for dirty tollars, unt put in de vindow glass for fife cents,—oh, mein! ven Mrs. Isaacstein nose dat she would make me gife her dot ealyskin coat vot she vants for de last dree years, unt I dells her pissness vas too pat to spend de money, aint it,—Maushel, you vos schmart for onst.

Moral.—Amateur, beware of snaps in lenses.

J. FREDERICKS.

NOTES.

THE POSTAL PHOTOGRAPHIC CLUB has been reorganized with Thomas Mansell as President, and Dr. J. Max Mueller as Secretary and Treasurer, and will, it is hoped, have better success as to permanency and punctuality than formerly.

Every member will please forward one or more prints to the Secretary up to the 15th of each month; whilst the Album will start on its travels on the first of each month, the first Album will be issued on January 1st, 1889.

Members neglecting to forward their quota of prints at the time specified will be excluded from representation in the next month's Album, and also from receiving the same until such time as prints of theirs are represented.

Data slips, which can be had upon application to the Secretary, must accompany each print or prints, and must be filled out fully and explicitly.

Prints of any kind, except blue prints, up to 8x10 size, are admissible, but they must be the sole and individual work of the member so sending them. If not, it must be so stated on the data slip.

The Note Book, which accompanies each Album, is for the purpose of criticism of the prints contained in the Album, and every member is expected to freely use it. Pages will be devoted to "Apparatus Wanted," "For Sale or Exchange," also for remarks not pertaining to the prints, but for the good of the club and our art.

Members will retain Albums no longer than three days from date and hour of its receipt, when they will express it, prepaid, to the next member on the list. Fines will be fixed for the breaking of this very important rule, for this very thing was one of the main causes of trouble and annoyance to our former Secretary and members.

Dues are fixed at $3.00 per annum, payable to the Secretary in advance on joining the club. The club will be conducted in the most economical manner. Should, however, the above amount be insufficient to defray expenses, *pro rata* assessments may be made.

Our new club is meant to be carried on on a strict business basis, and all members are earnestly requested to do their share towards maintaining the rules, otherwise we will surely break up again.

Efforts are now made to collect the property of the P. P. C. which, if successful, will be at the service of our members. This property consists of albums, stationery, books, etc., we believe, and is now in the hands of former officers and members of this club.

Yourself and friends are requested to join our club by notifying the Secretary and forwarding your dues and prints at your earliest opportunity.

By order of

THOMAS MANSELL, *President.*

DR. J. MAX MUELLER, *Secretary.*

MR. JOHN CARBUTT is worthy of all praise for the production of the *Flexible Film*, which possesses not only all the virtues of glass-plate, but many qualities which it is impossible to secure with glass; we say nothing of the great advantage of lightness and freedom from risk of breakage, but would call attention to the peculiar virtue they possess in giving pictures of interiors free from halation. Those who have been chagrined to acknowledge that their best work is often marred by this failing of the glass plate, will greatly appreciate this immunity of the film. For flash-light work they are to be highly recommended.

The great objection hitherto to the use of any substitute for glass has been the trouble that attends subsequent manipulation of the exposed plate, in the opinion of many more than counterbalancing the facility gained in the operation of making the exposures.

The flexible films are as easy of manipulation as glass plates, and require no more care in management. The only disadvantage they possess is the increased price, but this will very shortly be reduced by the great demand which is bound to come very soon.

Mr. Carbutt has sent us a photograph, cabinet size, made by F. Gutekunst, from one of the film negatives. The characteristic excellence of Mr. Gutekunst's work is well displayed in the print, which gives evidence of the beauty of the negative from which it was made.

WE have received an invitation to attend the third exhibition of the Pacific Coast Amateur Photographic Association, of San Francisco, Cal.

Although we regret our inability to accept the kind offer on account of the great distance, we appreciate the kindness, and shall preserve as a memento the beautiful

photogravure accompanying the invitation. The subject, "The Critics," is happily chosen for the occasion, artistically conceived and photographically perfect. It is the work of Mr. N. H. Lowden.

THE first of the photographic annuals has reached us. It is the old reliable stand-by, *Mosaics*, edited by Edward L. Wilson, of the *Philadelphia Photographer*. We are glad to see that the editor has kept his sheaf of gathered grain in its same old binding, and has not swelled it beyond due proportions with matter scarcely relevant to photography, as the manner of some is. It has its usual quota of good papers on a variety of subjects connected with photography, from the pens of men who are well known as ready writers in our art. *Mosaics* for 1889 is embellished with a number of excellent reproductions by the Moss Engraving Co., and the Albertype Co., of New York.

A MEMBER of the Photographic Society of Philadelphia showed at the last meeting an ingenious method of securing, in a photographic picture of an interior, the distant landscape through an open window.

The exposure was made late in the afternoon, the camera being pointed at the window, and the focus taken upon the landscape. After sufficient time had been given for securing the outside view through the window, the cap was placed upon the lens, and when the night set, in taken off again, and the exposure made with Blitzpulver upon the room. The result was beautiful, the details in the room coming out distinctly, while the scene through the window added much to the pictorial effect.

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Accessories:

1—Perfect Camera Stand for 8x10 . . . . . 8 00
1—Iron Centre Camera Stand, . 3 00
1—14-in Eureka Burnisher . . 16 00
1—20-in Entrekin Eureka Burnisher 30 00
1—Seavey Swiss Cottage Accessory 12 00
1—8x10 Exterior Ground, good condition, ... 10 00
2—Spencer Head-rests 11 00
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Photo Mosaics for 1883, ... 20
1—8x10 Plain painted ground . 3 00
1—Knickerbocker stand, with 14x17 top 9 00
1—8x10 Osborne's interior background, new, light left . . . 20 00
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Pearl leads, the best retouching point in the market, each . 15
8x10 Job Lot Picture frames; write for particulars.

Desiring to reduce our stock, we will sell for a short time.

	PER DOZ.
5x8 Woodbury Dry Plates . . .	80
5x7 " " . . .	77
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5x7 " " . . .	55
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5x8 Neidhardt " . . .	65
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1—8x10 Hough's Exterior ground, good as new, light left of sitter 9 00
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1—Osborne's No. 71 Rock Accessory 9 00
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1—5x8 Negative Box 50
1—Pneumatic Drop Shutter, fitted for no. 2 Darlot lens 2 00
24—5x8 Printing Frames, each . 30
6—4¼x6½ Printing Frames, each 25
3—3¼x4¼ Printing Frames, each 20
1—Scovill Extension Tripod and canvas case, ... 2 50

Camera Boxes:

1—5x8 Blair View Camera, single swing 17 00
1—5x8 Novalette Camera, 3 holders, Darlot view lens and tripod 30 00
1—Climax Outfit, including chemicals, complete 3 50
1—17x20 D. S. Portrait Camera, good condition 40 00
1—½ size Ferro. Camera, 2—¼ lenses and stand 10 00
1—4¼x6½ Novelet Camera . . 16 00
1—5x7 Victoria Ferro. Camera . 10 00
1—8x10 American Optical Co.'s Royal Camera, double swing and carriage movement, . 25 00
1—8x10 Ferrotype Box, Carriage movement and glass cornered holder and 4x4 lens 30 00
1—5x8 Tourist Outfit, including 5x8 Tourist Camera Box, 2 Daisy Plate Holders, 1 Extension Tripod, and 1 Canvas Carrying Case, very little used. Price, new, $40.50, will sell for 30 00
1—10x12 Cone View Camera, Double Swing, new 52 80
1—4x5 Flammang revolving back Camera, new, ... 25 00
1—4¼x5½ No. 202 A. Scovill Outfit 20 50
1—6½x8½ View Camera and Lens 12 00
1—5x8 Wet Plate Stereo Camera, 3 holders, case and tripod . 25 00
1—6½x8½ American Optical Co. first qual. View Camera . . 23 00
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1—5–8 New Model Improved Camera and three holders, . 16 00

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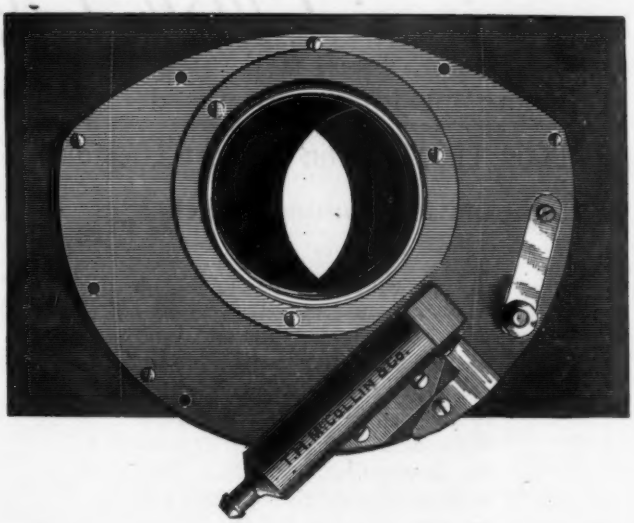
FOR VIEWS.



THIS Shutter fastens on the outside of the front board. The flange of the lens is screwed on to the Shutter as shown in the cut, thus placing the lens in front of the Shutter.

It can be changed from an instantaneous to a time Shutter by simply moving the lever shown in the cut, and is exceedingly practical and simple in its workings.

Price, up to Two-Inch Opening, $8.00.
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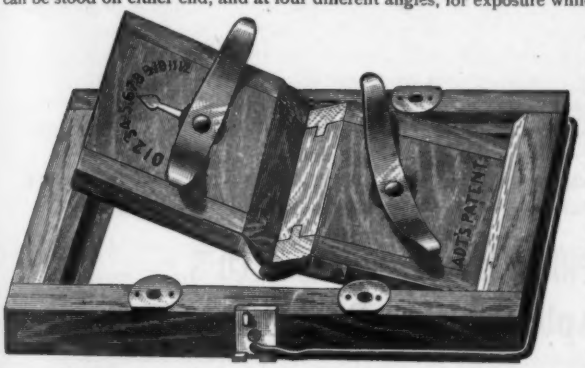
The Printing Frame of the Future.

As will be seen by a glance at the cut, the adjacent edges of the parts of the back-board are beveled outward, and the hinges placed on the sides with their axes on a line with the surface. This permits the attachment to the face of the back-board of a Heavy, Continuous, Elastic Felt Pad, manufactured especially for this particular purpose. This obviates the necessity of using a separate pad, which is so easily misplaced and lost. It will be seen that there is absolutely no strain on the pad in opening and closing the back-board, as it in no way acts as a hinge and will not become worn at the joint in the back-board, the hinges being of metal and placed on the sides.

This particular construction and manner of hinging can be used *without* a pad, which demonstrates the fact that the pad *does not* act as a hinge.

Adt's Patent Printing Frames are now supplied (without extra charge) with Adt's Patent Support, with which the frame can be stood on either end, and at four different angles, for exposure while printing.



One great advantage of this support, in addition to its convenience in supporting the frame, arises from the fact that it is out of the way of the printer when introducing the paper, or examining the print, for when the frame lies or is held with back up, the support instantly drops upon its stops for rest, and is entirely out of the way of the hand of the printer, so that he may remove or open the back-board, or replace it, as if there were no support present.

Again, it being arranged close around the sides and ends of the frame, it occupies so little space as not to interfere with the packing or storage of the frames, and when the printerplaces his frame for exposure the support readily finds its position for supporting the frame without any special manipulation by the printer.

Another valuable feature is Adt's Patent Tally, which, without any exception, is the best, strongest and simplest in use. It is impossible for this Tally to get out of order, on account of its simplicity.

BEWARE OF IMITATIONS WHERE THE PAD ACTS AS A HINGE.

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3¼ x 4¼	$0 50	6½ x 8½	$0 75
4 x 5	50	8 x 10	85
4¼ x 5½	50	10 x 12	1 15
4¼ x 6½	60	11 x 14	2 15
5 x 7	65	13 x 16	2 40
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When made with backs to open lengthwise, an additional charge of ten per cent. will be added o the above prices.

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PANTAGRAPH RAPID RECTILINEAR LENSES.

The Pantagraph Rectilinear Lenses possess many valuable properties peculiar to themselves. They are perfectly rectilinear, and work well with the largest diaphrams for groups and instantaneous views. Their great compactness and lightness are a boom to the out-door artist, while their flatness of field and their penetrating power, in which, from carefully made tests, they are equal to many of the noted lenses in the market, render them very valuable for landscapes and copying work of every discription.

For those to whom the price of our Francaise Lenses would be an obstacle, The Pantagraph Lenses will be found especially satisfactory.

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Pantagraph Rapid Rectilinear Lenses.

Catalogue No.	Size of Plate.	Diameter of Lens.	Back Focus.	Equivalent Focus.	Extreme Angle	Price.
P-41.	3¼ x4¼ ins.	⅝ ins.	4 ins.	4⅞ ins.	80°	$ 10 00
P-42.	4 x5 ins.	1 1-16 ins.	5 ins.	5¾ ins.	78°	12 00
P-43.	5 x8 ins.	1 5-16 ins.	8 ins.	8¼ ins.	66°	15 00
P-44.	6½x8½ ins.	1¾ ins.	10¼ ins.	11 ins.	66°	24 00
P-45.	8 x10 ins.	2⅛ ins.	13 ins.	13¾ ins.	66°	30 00
P-46.	10 x12 ins.	2½ ins.	15 ins.	16 ins.	66°	36 00
P-47.	12 x15 ins.	2¾ ins.	20½ ins.	22 ins.	66°	42 00
P-48.	17 x20 ins.	3¼ ins.	25 ins.	27½ ins.	66°	60 00
P-49.	20 x24 ins.	3¾ ins.	28½ ins.	31 ins.	66°	100 00

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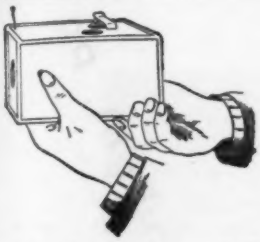

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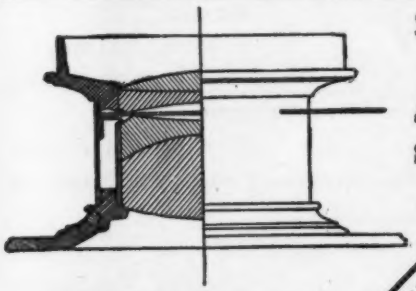

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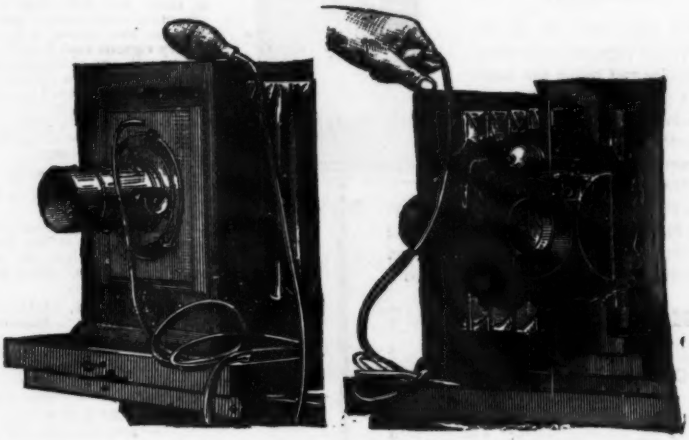

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